

Applicants : David M. Mitteer et al.
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This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (previously presented): An electrically powered actuator, comprising:

a housing;

a coil disposed in the housing for generating a magnetic field when an electric current passes through the coil;

a center pole disposed within the coil, wherein the center pole is made of a ferromagnetic material;

a rod assembly movably disposed in the housing for movement between a rest position and an energized position, the rod assembly having a portion thereof disposed in the center pole, and including a magnet having a polarity causing the magnet to be repelled from the center pole when an electric current passes through the coil; and wherein:

the magnet is encapsulated by an elastomeric material that contacts a stop surface when in the rest position to reduce noise resulting from shifting of the rod assembly from the energized position to the rest position.

Claim 2 (previously presented): The electrically powered actuator of claim 1, wherein:

the rod assembly has an elongated body portion comprising a polymer material.

Claim 3 (currently amended): ~~The electrically powered actuator of claim 2, wherein:~~ An electrically powered actuator, comprising:

a housing;

a coil disposed in the housing for generating a magnetic field when an electric current passes through the coil;

a center pole disposed within the coil, wherein the center pole is made of a ferromagnetic material;

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a rod assembly movably disposed in the housing for movement between a rest position and an energized position, the rod assembly having an elongated body portion comprising a polymer material, and wherein a portion of the rod assembly is disposed in the center pole, and including a magnet having a polarity causing the magnet to be repelled from the center pole when an electric current passes through the coil;

the magnet is encapsulated by an elastomeric material that contacts a stop surface when in the rest position to reduce noise resulting from shifting of the rod assembly from the energized position to the rest position; and wherein:

the polymer material has a reflow temperature that is greater than the injection molding temperature of the elastomeric material.

Claim 4 (previously presented): The electrically powered actuator of claim 3, wherein:

the magnet is generally disk-shaped with generally parallel side surfaces and an opening extending between the side surfaces, and wherein the body portion extends along the side surfaces to retain the magnet.

Claim 5 (previously presented): The electrically powered actuator of claim 4, wherein:

the body portion includes a pair of outwardly extending flanges forming an annular groove therebetween having a base surface and parallel sidewall surfaces, the base surface and the sidewall surfaces contacting the magnet.

Claim 6 (previously presented): The electrically powered actuator of claim 2, wherein:

the magnet is positioned adjacent a first end of the rod assembly; and wherein:

the rod assembly includes a pawl member made of a non-ferromagnetic material at a second end of the rod assembly, the pawl member being made of material that is substantially harder than the polymer material of the body portion.

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Claim 7 (previously presented): The electrically powered actuator of claim 6, wherein:

at least a portion of the pawl member extends outside of the housing when the rod assembly is in the rest position.

Claim 8 (currently amended): ~~The electrically powered actuator of claim 7, wherein:~~ An electrically powered actuator, comprising:

a housing;

a coil disposed in the housing for generating a magnetic field when an electric current passes through the coil;

a center pole disposed within the coil, wherein the center pole is made of a ferromagnetic material;

a rod assembly movably disposed in the housing for movement between a rest position and an energized position, the rod assembly having a portion thereof disposed in the center pole, and including a magnet positioned adjacent a first end of the rod assembly having a polarity causing the magnet to be repelled from the center pole when an electric current passes through the coil, the rod assembly having an elongated body portion comprising a polymer material;

wherein the magnet is encapsulated by an elastomeric material that contacts a stop surface when in the rest position to reduce noise resulting from shifting of the rod assembly from the energized position to the rest position; and wherein:

the rod assembly includes a pawl member made of a non-ferromagnetic material at a second end of the rod assembly, the pawl member being made of material that is substantially harder than the polymer material of the body portion;

at least a portion of the pawl member extends outside of the housing when the rod assembly is in the rest position; and

the pawl member is made of a stainless steel material, and the body portion is made of a fiber reinforced polymer material.

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Claim 9 (previously presented): The electrically powered actuator of claim 8, wherein:
the rod assembly defines an axis and the pawl member includes a connector portion having a first portion extending in the direction of the axis, and a second portion extending transverse to the axis, the connector portion being encapsulated by the body portion.

Claim 10 (previously presented): A rod assembly for an electrically powered actuator, comprising:

an elongated body made of a first material having a first melting temperature;
a magnet connected to the elongated body; and
a second material encapsulating at least a portion of the magnet, the second material having a second melting temperature that is less than the first melting temperature.

Claim 11 (original): The rod assembly of claim 10, wherein:

the second material has a hardness between about thirty-five to ninety Shore A durometer to form a damper.

Claim 12 (original): The rod assembly of claim 10, wherein:
the first material comprises a polymer material.

Claim 13 (original): The rod assembly of claim 12, wherein:
the polymer material is reinforced with fibers.

Claim 14 (original): The rod assembly of claim 10, wherein:
the magnet is generally disk-shaped with generally parallel side surfaces and an opening extending between the side surfaces, and wherein the body portion extends along the side surfaces to retain the magnet.

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Claim 15 (original): The rod assembly of claim 14, wherein:

the body portion includes a pair of outwardly extending flanges forming an annular groove therebetween having a base surface and parallel sidewall surfaces, the base surface and the sidewall surfaces contacting the magnet.

Claim 16 (original): The rod assembly of claim 15, wherein:

the magnet is positioned adjacent a first end of the rod assembly; and wherein:

the rod assembly includes a pawl member made of a non-ferromagnetic material at a second end of the rod assembly, the pawl member being made of material that is substantially harder than the polymer material of the body portion.

Claim 17 (previously presented): A method of making an electrically powered actuator, comprising:

providing a housing;

positioning a coil in the housing;

positioning a center pole of a ferromagnetic material within the coil;

providing a rod assembly having a body portion of a first material;

providing a magnet;

positioning the magnet on the body portion; and

encapsulating at least a portion of the magnet with an elastomeric second material to thereby form a damper that contacts a stop surface.

Claim 18 (original): The method of claim 17, wherein:

the magnet is generally disk-shaped with opposite side surfaces and an opening extending between the opposite side surfaces; and

the body portion includes retaining portions that are molded around portions of the opposite side surfaces of the magnet.

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Claim 19 (original): The method of claim 18, wherein:

 a peripheral outer edge of the magnet is exposed after the body portion is molded around opposite side surfaces of the magnet, and the retaining portions comprise a pair of outwardly extending parallel flanges defining inner surfaces contacting the magnet and opposed outer surfaces; and including:

 overmolding the second material around the peripheral outer edge of the magnet and around the opposed outer surfaces of the flanges.

Claim 20 (original): The method of claim 19, wherein:

 the second material has a Shore A hardness of about thirty-five to ninety durometer.

Claim 21 (original): The method of claim 20, including:

 providing a pawl member made of a non-ferromagnetic material and having a first end forming connecting structure; and

 molding the body portion around the connecting structure.

Claim 22 (previously presented): The method of claim 17, wherein:

 the body portion is molded of a polymer material having a first melting temperature;

 encapsulating at least a portion of the magnet includes overmolding the magnet with the second material; and

 the second material has a molding temperature that is less than the reflow temperature of the polymer material.